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This relates to the art of papermaking, and more particularly, to a sturdy, simplified yet versatile papermaking machine structure connected with the web pickup from the forming wire and initial web pressing station.

As in the case of most arts at the present time, overspecialization has tended to lead to papermaking machine structures which are adapted for a certain given set of conditions but which otherwise do not possess any great degree of versatility with respect to variations in machine speed and/or types of paper which can be made thereon. Needless to say, the versatility just suggested for papermaking machines becomes less attractive to the paper maker with increased expense or complexity in the installation or use of the resulting papermaking machine. Thus, versatility with respect to such matters as speed and paper weight could ordinarily be possible with many papermaking machines, if such machines were complicated by substantial auxiliary equipment of one type or another, all of which would cost more money in the initial investment and may or may not cause operating complications.

In the practice of the instant invention, however, a particularly simple papermaking arrangement is demonstrated and its versatility is also demonstrable from a reading of the following specification. Although certain of the more specific aspects of the advantages of the instant invention will be discussed in detail hereinafter, it is important to note that the present papermaking machine affords advantages in that it is simple, sturdy, compact, versatile and easily maintained.

Other and further objects, features and advantages of the present invention will become apparent to those skilled in the art from the following detailed disclosure thereof and the



drawings attached hereto and made a part hereof.

On the Drawings:

Figure 1 is an essentially schematic elevational view of an embodiment of the instant invention; and

Figure 2 is another essentially schematic elevational view showing a new arrangement, which is a modified form of the embodiment of Figure 1.

As Shown On the Drawings:

In Figure 1 it will be seen that there is shown a paper machine web pickup and press section indicated generally by the reference numeral 10. The downstream end of a looped forming wire 11 is shown traveling over a couch roll 12 then down an inclined forming wire run 11a and around a turning roll 13 which feeds the wire 11 back to the upstream end of the papermaking machine. The wire run 11a is maintained under conventional operating tensions in order to define a generally uniplanar wire run 11a. A freshly formed moist paper web W travels along the top of the forming wire 11 over the couch roll 12 and down along the top of the inclined wire run 11a to reach a pickup nip N-1, where the web W urged against a traveling pickup felt or fabric 14 by a pickup roll 15 transverse from the top side of the wire run 11a to the bottom side of the porous felt run 14a for a very brief distance until it is transferred onto a press felt top run 30a.

To be more specific, it will be seen that the pickup felt or fabric 14, which is preferably a comparatively lightweight felt, wraps the suction pickup roll 15 at an initial high vacuum suction area 15a followed by a low vacuum suction area 15b over which the bottom run 14a of the felt is trained and over which it

carries the web W on its underside. The felt run 14a proceeds downstream but in closely spaced relation from the web W (after it has transferred the web W onto the top run of the press felt 30) until the pickup felt run 14a reaches a guide roll 16a. The looped felt 14 travels around the guide roll 16a and also the guide rolls 16b and 16c and the tensioning roll 16d, all of which rolls are essentially conventional in structure and function as shown in Figure 1. It will be appreciated that the high vacuum suction area 15a wrapped by the felt or fabric 14 at the pickup nip N-1 serves to lift the web W from the surface of the downwardly inclined forming wire run 11a (with the benefit of a sufficient washing surge of water from and through the underside of the wire) to assist in substantially complete removal of the web W by the felt run 14a covering the high vacuum area 15a in the suction pickup roll 15.

The immediately subsequent lower vacuum suction area 15b in the pickup roll 15 that is covered by the lightweight felt or fabric 14 will serve to retain the web W on the underside of this pickup felt run 14a. In fact, in certain machine structures the second suction area 15b may not be required, but in any event the immediate advantage afforded by the arrangement here shown is that the web W is picked up by the pickup felt 14 in such a manner that it is not necessary to press the pickup felt 14 backed by the suction roll 15 against the web W on the wire run 11a with any extremely great pressing force. Instead, the felt 14 is brought gently into good contact with the top surface of the web W and the high vacuum suction area 15a immediately functions to effect the web pickup or transfer to the underside of the pickup felt run 14a.

The felt 14 used for the foregoing pickup purposes is a comparatively lightweight felt or it may be a fabric (e.g. such as a plastic forming wire or other type of plastic woven fabric that is capable of generally prolonged wear), and the body of the felt 14 or fabric is such that it will lend itself readily to the retention of the web W on the underside thereof, particularly when subatmospheric pressure is maintained along the top side of the pickup felt run 14a by virtue of the suction areas 15a and 15b here shown in the pickup roll 15. At the immediate off-

10 running side or downstream side of the low vacuum suction area 15b, it will be appreciated that the felt run 14a is starting to separate from the surface of the pickup roll 15 and there will be no significant subatmospheric pressure along the top side of the felt run 14a, hence the rather delicate transfer of the web W at this stage from the underside of the pickup felt run 14a to the top side 30a of the press felt 30 is accomplished very readily. The press felt 30 would ordinarily be a somewhat sturdier felt than the pickup felt 14, because it must pass through a press nip at N-2, but there is no difficulty in connection with the

20 mounting of a suction area in the press felt guide roll 31a at 31b, which suction area 31b will be wrapped by the top run 30a, but it will position the top run 30a in close running relation to the off-running side of the pickup nip N-1 and also in very close running relation to the underside of the pickup felt run 14a so that web transfer from the underside of the run 14a to the top side of the press felt 30a is accomplished without the necessity for pressing the felts 14 and 30 at a press or transfer nip. The suction pickup roll 15 and the suction guide roll 31a do not define a press nip therebetween. Instead, there is a slight

spacing or gap through which both felts 14 and 30 may travel without being pressed together (with or without the web W).

The advantage of this type of web transfer between the felts 14 and 30 will be appreciated, particularly from a practical point of view, when it is noted that the pickup felt 14 travels such that it does not go through any press nip. Heretofore, it was ordinarily conventional to employ the pickup felt in a first press nip, which would operate at moderate pressures, but which would function essentially as a transfer nip in order to transfer the web from one felt to another. In such an arrangement, it will be appreciated that it was necessary to pass two felts through the press nip and, in so doing, the actual amount of dewatering of the web going through the transfer nip was comparatively modest. Nevertheless, most of the essential equipment employed in setting up press rolls in controlled nip-defining relation would be required for the transfer nip; and this represents a significant capital expenditure.

Additionally, the fact that the pickup felt 14 does not go through a press or transfer nip of any sort is particularly significant from the point of view of wear on the pickup felt or fabric 14. There is no need to carry out the rather vigorous cleaning and reconditioning procedures (with wringer rolls, etc.) that would otherwise have been required in connection with a pickup felt which ultimately transferred the web to a press felt at a press nip. In the present instance the pickup felt or fabric 14 will have considerably longer useful life than other conventional pickup felts which are used in machines wherein they must pass through a press nip.

Moreover, as will be seen in connection with Figure 2,

the particular felt 14 and pickup roll 15 mounting arrangement is such that the pickup roll 15 is swingably mounted for selected and controlled urging of the pickup felt against the web W on the downwardly inclined wire run 11a, and for selectively removing the pickup felt 14 and the pickup roll 15 from the immediate web pickup position, for cleaning or for running different types of paper web through an open draw, or the like, all of which will be discussed in greater detail in connection with the embodiment of Figure 2.

In the specific embodiment of Figure 1 the adjustability
 10 of the suction pickup roll indicated schematically by the double headed arrow 15c is functionally useful in connection with adjustment of its position in close running operating relation to the guide roll 31a and also in connection with the careful and controlled selection of the pressure used to urge the pickup felt 14
 20 against the web W at the web pickup station or nip N-1.

Referring next to the travel of the press felt 30 in Figure 1, it will be seen that this felt travels over the suction guide roll 31a, through the first (generally horizontal) press nip N-2 defined by an upper plain roll 32 and a lower roll 33, then
 20 around guide rolls, as at 31c and 31d (for return of the press felt loop 30 which is not shown completely). The bottom roll 33 may be a suction roll (with suction gland at 33a) or it may be a grooved roll with imperforate shell or it may be a grooved suction roll 33 as here indicated schematically.

The grooves in the roll 33 are those described and claimed in E. J. Justus U. S. Patents Nos. 3,198,693, 3,198,694, 3,198,695, 3,198,696 and 3,198,697. Such grooved roll 33 and a grooved roll 43 (with imperforate shell) at the next press nip N-3 are used herein as very effective dewatering press rolls,

pursuant to the teachings of said patents. The first press N-2 here indicated is preferably operated at about 100-200 pli, but with an imperforate shell at about 300 pounds per lineal inch, which is considerably higher than the pressures that might be used in connection with a conventional transfer press nip receiving both the pickup felt and the press felt. In fact, the press rolls 32 and 33 are mounted for use at the first press and dewatering nip N-1 at pressures as high as 450 pounds per lineal inch. The second press and dewatering nip also defined
10 between a top plain roll 42 and the bottom grooved roll 43 is preferably designed to operate at nip loads as high as 600 pounds per lineal inch, although it is generally preferred to use a nip pressure of about 450 pounds per lineal inch at the second press nip N-3 if the first press nip N-2 uses about 300 pounds per lineal inch nip pressure. In such instance still another press nip N-4 (not shown) is used preferably at 450 to 600 pounds per lineal inch to complete the pressing and dewatering and the third active press nip N-4 which is not shown in Figure 1 would have a nip structure and felt arrangement substantially identical
20 to that here shown for the second nip N-3. Thus the press felt 40 is mounted on guide rolls 41a, 41c, 41d, 41e and 41f. The guide roll 41a extends a top press felt run 40a to close running relation to the off-running side of the first press nip N-2. The web W tends to follow the uprunning side of the plain roll 32 for a little while until it drops over onto the top run for the felt 40 between the guide rolls 41a and 41f which move the web W on the top run 40a over to the down-running side of the plain press roll 42. Here the web continues on into the nip N-3 and the felt 40 is briefly separated from the web W but

returns to contact the web W at the nip N-3, where the press felt 40 wraps the grooved roll 43 for the purposes of protecting the felt W at the nip N-3, in the manner described in considerable detail in the aforesaid E. J. Justus patents. The web W and press felt 40 are again separated rapidly at the off-running side of the press nip N-3 and the web travels again temporarily on the uprunning side of the plain roll 42 until it is dropped off onto still another top run 50a of a felt 50 which is here shown trained about guide rolls 51a and 51b. As previously indicated, the felt 50 is still another press felt for the next press nip (not shown) having an arrangement substantially identical to that shown for the second press nip N-3, in those instances in which a third press nip is desirable. On the other hand, the felt 50 may be used to convey the web on into the next section of the paper machine, if another press nip is not desired or required.

It will be noted that the loop for the second press felt 40 is not completed and this press felt 40 will also travel through conventional showers and reconditioning stations (not shown) for a press felt.

It will be appreciated that in the embodiment of Figure 1, the paper machine 10 has a number of advantages in the simplicity of its structure. Among these are the arrangement of the pickup felt 14 such that it is not taken through a press nip, and the very simple arrangements for the subsequent press and dewatering nips N-2 and N-3. Also, the ease of maintenance in connection with the operation of the instant machine 10 is important. For example, if either of the press felts 30 or 40 has to be replaced, the operation involved is such that no other felt arrangement will be disturbed at all. Thus, the pickup felt 14 would

not have to be disturbed nor would the other press felt 40 if the press felt 30 is to be replaced. The press rolls at the nip N-2 would have to be opened briefly, but the threading of the new felt would not involve any precautions or manipulations with respect to any of the other felts. Also, the press nips N-2 and N-3 are so arranged and mounted that there is no need for overhead framing or other complications which would be associated with top felts for either of the nips N-2 or N-3. Hence, maintenance is further facilitated by the ease of access to the top side of the press nips N-2 and N-3.

Referring to Figure 2, also, it will be noted that the guide roll 31a for the top run 30a of the press felt 30 is pivotally mounted or swung about a pivot 34 mounted on the front upstanding frame 60 (i.e., there will be matched front and back upright frames 60 mounting pivots 34 which swingably carry arms 35 for mounting the suction guide roll 31a, although the back members of these structures are not here shown). The upright framing element 60 is, however, shown fragmentarily but nevertheless shown so that it is apparent that such framing 60 as well as its upper cross piece 61 is positioned downstream of the forming wire loop 11 and the couch and turning rolls 12 and 13 defining the downstream end of the forming wire loop 11. Also, such framing 60 and 61 is mounted upstream substantially from the first press nip N-2. In Figure 1, it will be seen that a tensioning roll 16d is shown in its downstream position (as compared to its upstream or slack position indicated at 16d' in Figure 2), and the downstream extremity for the cross piece 61 on the upright framing 60 need not extend downstream beyond the position of 16d shown in Figure 1. Hence, 60 and 61 are indicated schematically in Figure 1 in

dashed lines.

Referring more specifically to the arrangement of Figure 2, it will be seen that the arm 35 upon which the guide roll 31a is swingably mounted is actuated by pneumatic means such as the diaphragm means indicated at 31a mounted on the inside of the framing upright 60 for controlled close adjustment positioning of the guide roll 31a, and the guide roll 31a is also tied to the upright 60 by means of a conventional turnbuckle arrangement shown schematically at 36, so that the roll 31a can be pulled back to-
 10 ward the inside of the press felt loop 30 for purposes of making a felt chance in this position. Essentially, all of the mounting means for the guide roll 31a are connected to the upright means 60 (at the front and back of the machine).

The mounting means for the pickup felt or fabric 14 in Figure 1 and 14' in Figure 2 (in the relaxed position) are also shown as being mounted on the simple framing elements 60 and 61 at the front and back of the machine. Thus, the guide rolls 16b, 16c and 16e remain in position mounted by conventional means (not shown) on top of the cross piece framing 61, but the tensioning
 20 roll 16d' is shown in Figure 2 in the retracted position since the tensioning roll 16d will be mounted on a carriage (not shown) conventional for tensioning rolls on a track (also not shown) on the top side of the cross framing 61.

The suction pickup roll 15' is swingably mounted on an arm 15d which swings on a pivot 15e of essentially conventional structure mounted front and back on the framing piece 61. Also swingable with the suction pickup roll 15' is the guide roll 16a' for the felt 14' by virtue of an arm 15f which carries at its downstream extremity the bearings 16aa for the guide roll 16a'

and which arm 15f is secured at a flange and bolt connection 15g to the bearing housing 15h for the swingably mounted suction pickup roll 15'.

In the position shown in Figure 2, the entire pickup roll 15' and felt 14' arrangement has been moved away from the web pick-up station N'. The web W' travels downwardly along the downwardly inclined forming wire run 11a' and in the embodiment here shown the web W' goes through an open draw, contacting a guide roll 62 briefly in the middle of this open draw but then traveling onto the top run 30a of the press felt 30 and continuing otherwise through the machine in substantially the manner already described. In the case of certain webs W', it is found that an open draw may be used and this is easily possible in the case of the instant paper machine because of the retractible or withdrawable arrangement that is provided for removing the pickup felt 14' to the position shown in Figure 2. Also, the pickup felt 14' can be changed or replaced while in this particular position shown in Figure 2 and without interference in any way with the operation of the remainder of the paper machine. The paper machine may thus be operated while the pickup felt 14' is being changed in the arrangement of Figure 2, assuming that the paper web W' then being formed and treated in the paper machine is one which may be used in the open draw (and/or around the guide roll 62 at the open draw arrangement here indicated). The retractible arrangement for the pickup felt 14' thus affords an element of versatility in permitting the paper machine to operate with different types of webs and, also, the arrangement of Figure 2 makes it possible to pull out the pickup felt 14' from operating engagement with the rest of the elements in the machine for purposes of making whatever changes

or taking care of whatever other maintenance may be involved in connection with the various elements here shown mounted on the framing 61. In such instances, production is readily changed to a different type of web (or for that matter a different overall type of operating conditions) to permit satisfactory function through the open draw here shown.

The movement of the suction roll 15' to the position shown in Figure 2 is accomplished by the use of jacks which are designated 80 (only the front side jack being shown) mounted on one pivot 81 preferably in an eccentric pivotal arrangement on the framing 61, and pivotally connected at 82 (shown schematically) to the main bearing housing 15h for the suction pickup roll 15' as shown in Figure 2. It is apparent that the use of the jack 80 at the front and back of the machine for coordinated movement of the front and back bearing housings 15h is well understood in the art and does not require any further description. Likewise, the changing of the felt or fabric 14' in the position shown in Figure 2 will be readily understood by the skilled workers in the art and need not be described in greater detail in connection therewith.

Essentially, the arrangement lends itself to withdrawing or moving the guide and suction pickup roll or rolls back toward the interior of the loop of the felt or fabric 14' so as to facilitate the changing of the looped felt 14' while the elements are in substantially the position shown in Figure 2.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of the present invention.

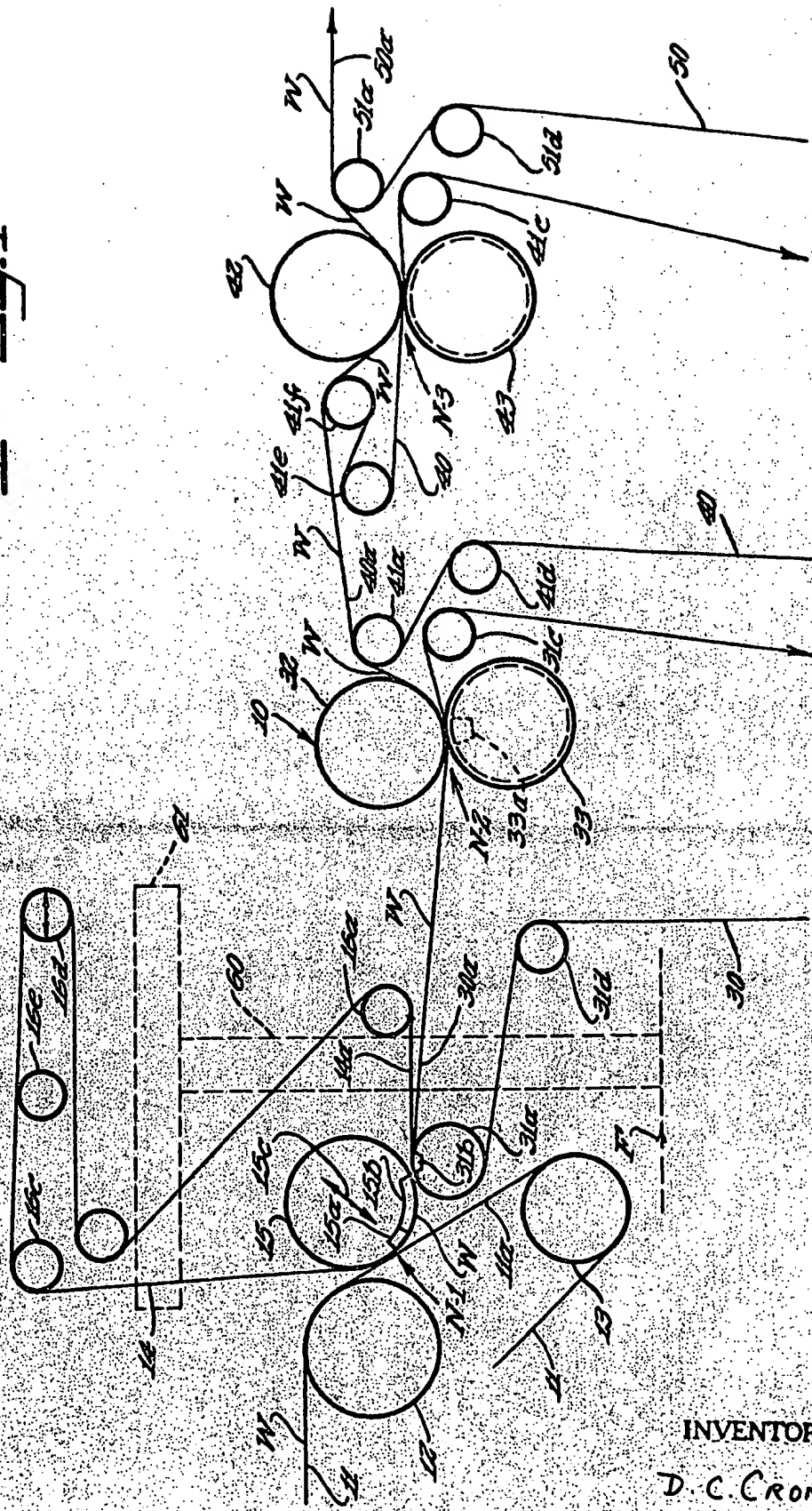
THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. In a web pickup arrangement for a papermaking machine having press nips defined by opposing press rolls in combination,
 - a forming wire for receiving stock to form a paper web thereon arranged to travel over a couch roll and then down an inclined run,
 - a looped pickup belt,
 - a suction pickup roll within the pickup belt urging the pickup belt against the web on said wire to pick up the web therefrom at a pick up point on said inclined run,
 - a looped press felt having a generally horizontal top run,
 - a guide roll within the loop of said press felt and mounted in close running relation to the pickup belt to receive the web from the pick up belt at a transfer point,
 - said web and said belt travelling directly between said pick up point and said transfer point without additional supporting rolls and without passing through a press nip,
 - said belt being turned directly off said inclined wire run at said pickup point and carried onto said generally horizontal felt top run at said transfer point by said belt,
 - and a first press nip receiving the press felt with the web thereon for pressing and dewatering the same,
 - said pickup belt leaving said press felt prior to passage of said press felt through said press nip.

2. In a web pickup arrangement according to claim 1 wherein the guide roll is a suction roll having a suction area covered by the press felt and positioned just beneath the pickup belt so that the belt and the press felt travel without being pressed together.
3. In a web pickup arrangement for a papermaking machine in accordance with claim 1 wherein the pickup belt has a pickup roll within the belt urging the web against the wire at said pickup point.
4. In a web pickup arrangement for a papermaking machine in accordance with claim 3 wherein the suction pickup roll has a suction area extending substantially from said pick up point to said transfer point.
5. In a web pickup arrangement for a papermaking machine in accordance with claim 3 wherein the pickup roll is movably supported for movement away from said pick up point.
6. In a web pickup arrangement in accordance with claim 5 including a web guide roll means contacting the web while the pickup roll is positioned away from said pick up point.
7. In a web pickup arrangement in accordance with claim 6 including means for moving said web guide roll for changing its running position relative to the pick up point.
8. In a web pickup arrangement in accordance with claim 1 wherein the pickup roll has a first area of high suction at the pick up point followed by an area of lesser suction.



FIG. 1



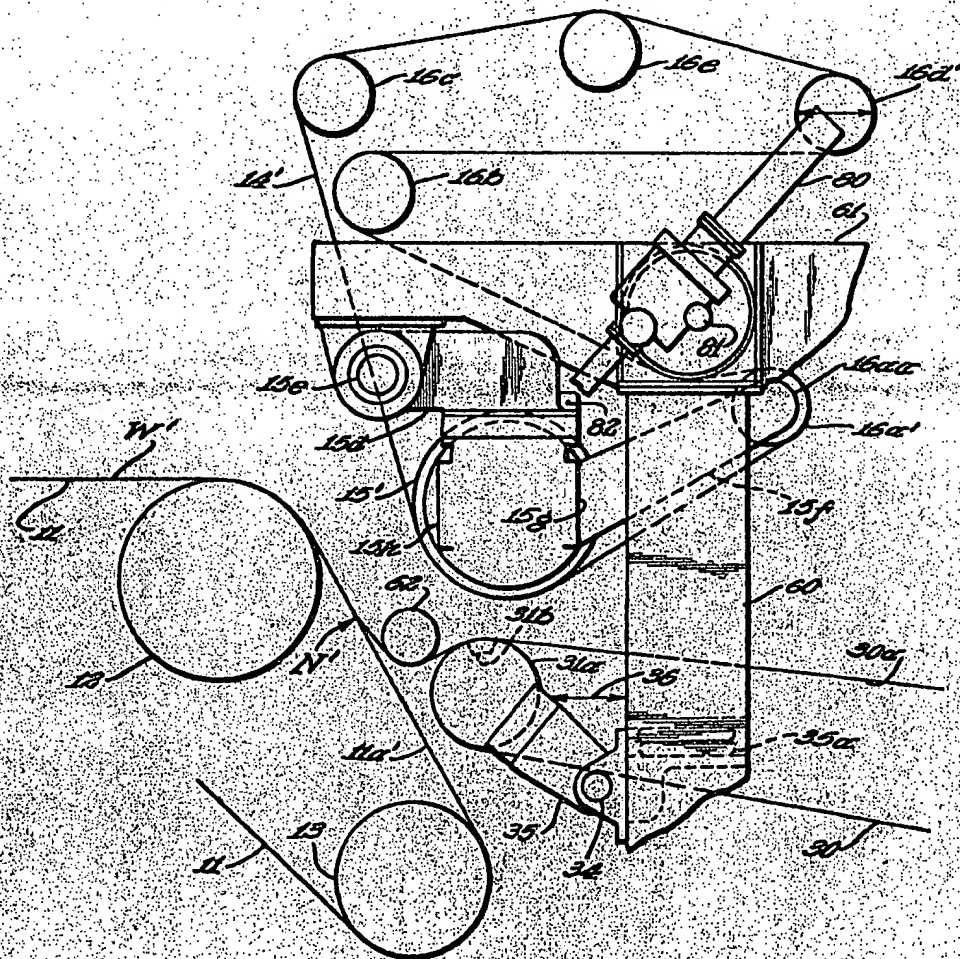
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